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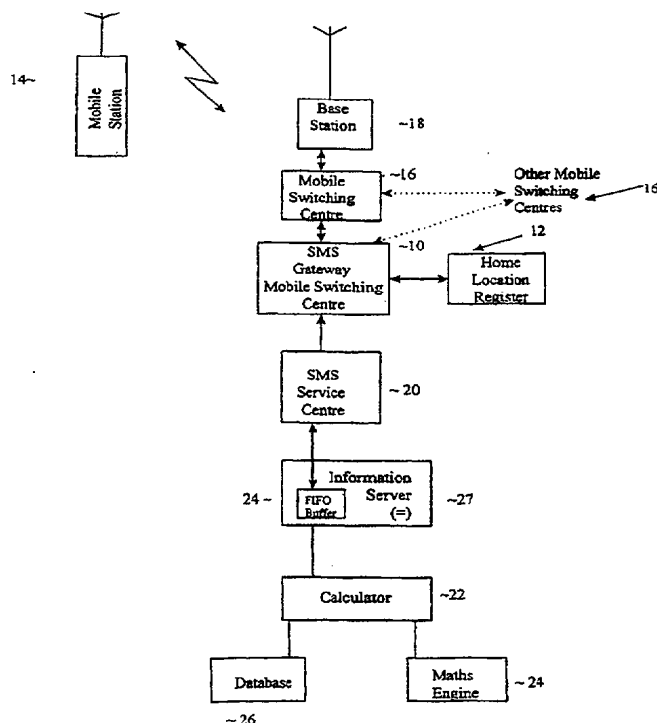
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(56) Documents Cited
US 5949857 A US 5872837 A US 4087635 A

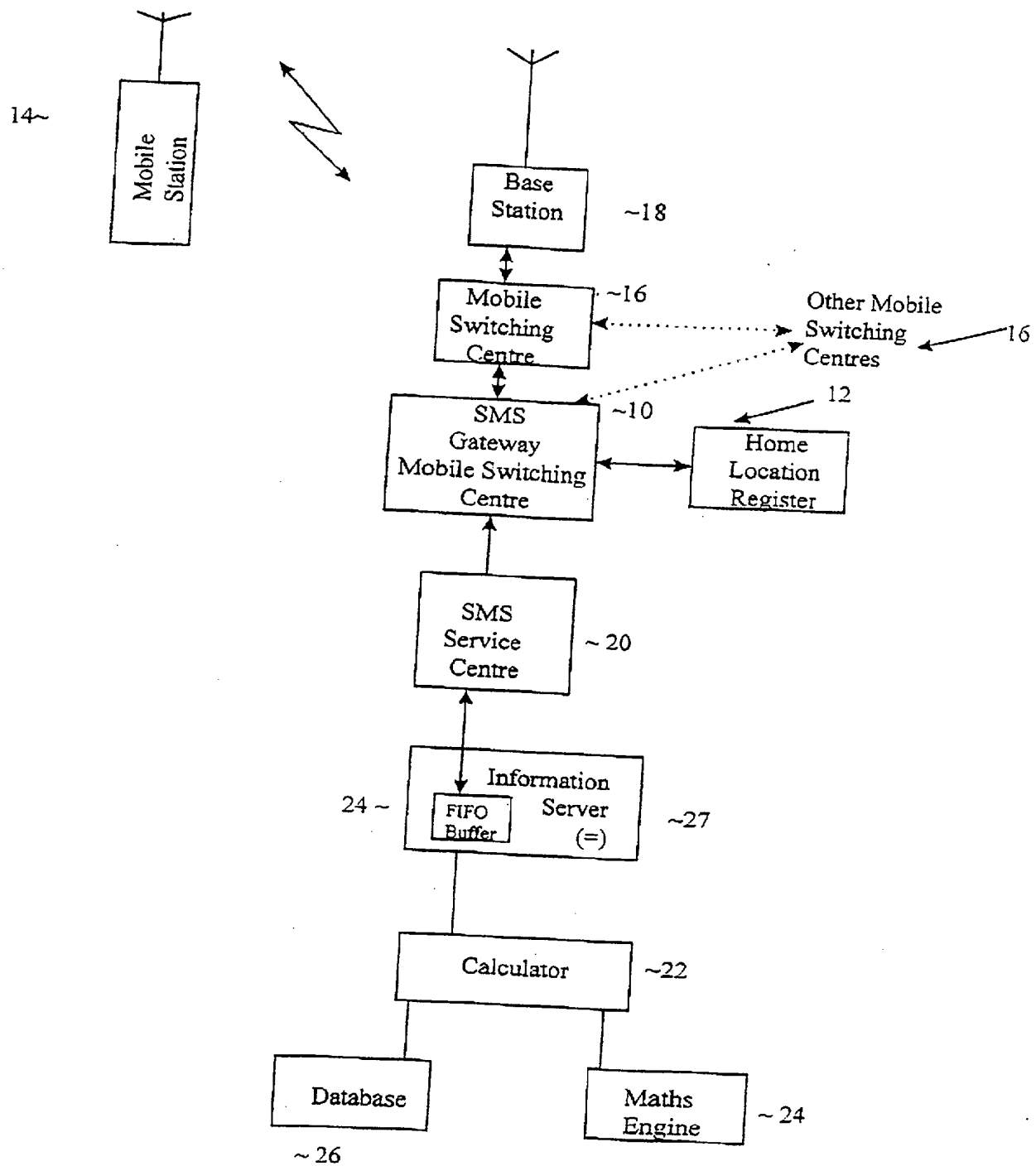
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(54) Abstract Title
Telephone text processing systems

(57) A telephone text processing system provides a calculator function for mobile telephones 14 by the provision at the SMS service centre 20 of a calculator 22 with a maths engine 24 and a database 26. A determination is first made whether an incoming text message to the service centre 20 is a calculation request, e.g. by identification of an "equals" sign at the end of the message. If so, there is a further determination by the calculator 22 as to whether the calculation request is for a symbolic arithmetic operation or for a numeric arithmetic operation. In the former case, and as a result of the determination, the result is retrieved from the database 26; in the latter case, the maths engine 24 performs the required numeric calculation. The result of the calculation is sent back to the requesting mobile telephone 14 in text message form.



GB 2 361 839 A



TELEPHONE TEXT PROCESSING SYSTEMS

This invention relates to telephone text processing systems, such as those suitable for use with mobile telephone networks for processing Short
5 Message Service (SMS) text on the Global System for Mobile Communication (GSM).

The ability to send text messages (such as SMS) using mobile telephones has led to increased use of mobile telephone networks for purposes other than voice communication. In particular, text messages sent
10 from mobile telephones may be interpreted at the network centre as requests for information, such as requests for news, weather or share prices, and these requests can be answered by the network centre sending back the appropriate information in text form.

There will be situations in which the owner of a mobile telephone will
15 require more complex functionality from the network centre. The present invention addresses such a requirement.

According to the invention there is provided a telecommunications services apparatus for receiving and responding to text messages from a telephone network, the apparatus comprising means for determining from a
20 received text message whether the text message is a request for an arithmetic calculation, means for performing the calculation to provide a result, and means for sending the result of the calculation in text form back to the originator of the text message who requested the calculation.

In a preferred embodiment of the invention, the apparatus is intended
25 for a mobile telephone network such as a GSM network, and includes means for determining whether the calculation request is for a numeric arithmetic operation (such as $3! + 2 \sin 30 =$) or for a symbolic arithmetic operation (such as $\sin(A + B) =$); a maths engine performs the numeric operation (if required), whereas a database storing symbolic arithmetic functions is
30 operable to generate the required symbolic arithmetic function (if required). In the preferred embodiment, the determination as to whether a received text

message is a request for a calculation is based on the presence of an "equals" sign (=) at the end of the text message.

One advantage provided by the invention is that a mobile telephone user may not have direct access to a dedicated calculator, for example when away from home or office; it would, for instance, be very helpful to check on quoted interest rates (such as APRs) against repayment terms when on the premises of a financial institution or shop. Another advantage is that, even if a dedicated calculator is available, the memory capacity and processing ability of such a device are necessarily limited, such that complex calculations such as large number factorials take considerable time or may not even be possible. The preferred telecommunications services apparatus can be associated with a calculator engine of significantly greater processing capability and memory capacity than those available in a standard dedicated portable calculator, and so it is possible for far more complex calculations to be implemented.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying single figure drawing which shows a block diagram of a mobile telephone text processing system embodying the invention.

Referring to the drawing, there is shown a mobile telephone network incorporating a telecommunications services apparatus providing a calculator function. The network includes an SMS gateway mobile switching centre 10 operatively associated with a home location register 12 providing information as to the cells within which mobile stations 14 are currently registered. The gateway switching centre 10 is connected to a number of mobile switching centres 16 which are networked together. Each mobile switching centre 16 is connected to a base station 18 which communicates with the mobile stations 14. The gateway switching centre 10 is also connected to an SMS service centre 20.

Thus far, the network is configured in a standard manner, with incoming text messages from a mobile station 14 being directed to the

service centre 20 via the corresponding base station 18, mobile switching centre 16 and the gateway switching centre 10. In the preferred embodiment of the invention, by means of a suitable destination address to which a calculation request is sent, the SMS service centre 20 determines
 5 that the message is to be passed to an information server 27. The destination address would preferably be a short code such as 333. The information server 27 determines that a calculation request has been received, preferably by detection of an "equals" sign (=) at the end of the message and passes it to a calculator 22. Other types of message may be
 10 detected and handled appropriately by alternative applications. In the case of a calculation request, the calculator 22 performs a case independent, symbol independent, and white space independent comparison with a database 26. If a match is found, the database 26 provides the corresponding result which is returned to the sender using an identification
 15 code such as the CLI attached to the original message. If no match is found, the request is passed to a maths engine 24 for processing.

Return text messages may be sent via the gateway switching centre 10 which identifies from the home location register 12 which mobile switching centre 16 is required, based on the registered location of the
 20 mobile station 14. Other routes are possible. The text message is then sent to the appropriate mobile switching centre 16, and transmitted from the corresponding base station 18 to the requesting mobile station 14.

According to the preferred embodiment of the invention, the information server 27 includes a FIFO buffer 24 for receiving calculation
 25 request messages from the SMS service centre 20.

In operation, the SMS information server 27 recognises a text message from one of the mobile stations 14 as being a calculation request, preferably by identification of the "equals" sign (=) at the end of the message. For example, let it be assumed that the requested calculation in
 30 the text message is " $3! + 2 \sin 30 =$ ". Once identified as a calculation request, the text message is sent via the FIFO buffer 24 to the calculator 22.

If there is a queue of previous requested calculations, these are stored in order of arrival in the FIFO buffer 24 and processed in sequence. The calculator 22 performs the above-described comparison with the database 26. In the present example, no match is found and so the request is identified as being for a numeric operation, the text message being accordingly passed to the maths engine 24. The SMS string is then parsed by the maths engine 24. The expression is interpreted and processed, and the result is then created as an SMS message which is then returned to the SMS service centre 20 and thence to the original sender. In the present example, $3!$ is calculated as $3 \times 2 \times 1 = 6$, and $2 \sin 30$ is calculated to be $2 \times 0.5 = 1$ whereupon the two intermediate results are summed to produce the answer 7.

In an alternative example, the text message is interpreted by the calculator 22 to be for a symbolic operation, for example " $\sin (A + B) =$ " as a result of a positive comparison with the corresponding expression stored in the database 26, and the system will then send back the following result in the text message form:-
" $\sin A \cos B + \cos A \sin B$ ".

It will be apparent that the limitations of the system will be defined only by the memory capacity and processing speed, as well as the number of symbolic expressions held in the database, and these can be matched to the service provider's and customers' requirements. By combining the use of a powerful processor having mathematical parsing capability with a mobile telephone network, and in particular the SMS messaging capability, the user is provided with the means to access a calculator function at any time by the use of the user's mobile telephone.

A further significant feature of such a system is that requests to the system can be logged, and requests which cannot be satisfied can be periodically reviewed and used as input for database or other enhancements.

This can give such on-line services a considerable advantage over fixed data references such as encyclopedias where feedback to the publisher about missing information is not possible.

CLAIMS

1. A telecommunications services apparatus for receiving and responding to text messages from a telephone network, the apparatus comprising
5 means for determining from a received text message whether the text message is a request for an arithmetic calculation, means for performing the calculation to provide a result, and means for sending the result of the calculation in text form back to the originator of the text message who requested the calculation.
10
2. Apparatus according to claim 1, comprising means for determining whether the calculation request is for a numeric arithmetic operation or for a symbolic arithmetic operation, a maths engine for performing the numeric arithmetic operation if requested, and a database storing symbolic arithmetic
15 functions and generating the required symbolic arithmetic function if requested.
3. Apparatus according to claim 1 or claim 2, including a FIFO buffer for receiving multiple calculation requests, and for allowing the apparatus to
20 process the requests in sequence.
4. Apparatus according to claim 1, claim 2 or claim 3, wherein the means for determining whether the text message is a calculation request responds to the presence of an "equals" sign at the end of the text message
25 to interpret the text message as a calculation request.
5. Apparatus according to any one of the preceding claims, wherein the telephone network is a mobile telephone network.
- 30 6. Apparatus according to any one of the preceding claims, wherein the text messages are in short message service (SMS) form.

7. Apparatus according to any one of the preceding claims, including means for logging received text messages which are calculation requests, whereby such calculation requests which could not be calculated by the calculation performing means may be reviewed and the calculation
5 performing means may be adapted to perform such calculation requests.

8. A telecommunications services apparatus substantially as herein described with reference to and as illustrated in the accompanying drawing.



Application No: GB 0010067.7
Claims searched: 1-8

Examiner: John Betts
Date of search: 6 October 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.R): H4L (LDPP, LESF,LDGX)

Int CI (Ed.7): H04M 3/493 11/06 H04Q7/22

Other: On-line: WPI, EPODOC, JAPIO

Documents considered to be relevant:

| Category | Identity of document and relevant passage | Relevant to claims |
|----------|---|--------------------|
| A | US5949857 (IBM) | |
| A | US5872837 (MCI Worldcom) | |
| A | US4087635 (Vasquez) | |

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